

WHAT IS CLAIMED IS:

1. A nozzle regulator, comprising:
an outer tubular cylinder having a first radius;
5 an inner tubular cylinder having a second radius that is less than
the first radius and wherein the outer tubular cylinder and the inner tubular
cylinder are concentric about a longitudinal direction, wherein the inner tubular
cylinder is made of a deformable material such that when acted upon by a force
the inner tubular cylinder easily deforms but when the force is removed the inner
10 tubular cylinder returns to its original shape; and
an inlet section that connects the outer tubular cylinder and the
inner tubular cylinder at an inlet side in the longitudinal direction.

2. The nozzle regulator as set forth in claim 1, wherein the deformable
15 material comprises a rubber compound.

3. The nozzle regulator as set forth in claim 1, wherein the entire
nozzle regulator is constructed of the deformable material.

20 4. The nozzle regulator as set forth in claim 1, further comprising an
outlet nozzle formed by the offset of the inner tubular cylinder from the outer
tubular cylinder to an outlet side opposite the inlet side of the nozzle regulator
such that the output nozzle projects from the outer tubular cylinder.

25 5. The nozzle regulator as set forth in claim 1, wherein the inlet
section is a ring having a convergent cross-sectional shape in the longitudinal
direction such that the outer tubular cylinder and the inner tubular cylinder are
smoothly connected.

30 6. The nozzle regulator as set forth in claim 5, wherein the convergent
cross-sectional shape is a convex curve.

7. The nozzle regulator as set forth in claim 5, wherein the convergent cross-sectional shape is a straight line.

5 8. The nozzle regulator as set forth in claim 1, further comprising a nozzle regulator cavity formed by a junction of the outer tubular cylinder, the inner tubular cylinder, and the inlet section.

9. An automatically deformable nozzle regulator, comprising:
10 an outer cylinder having a hollow interior and an inlet side and a outlet side at opposite end of the cylinder along a longitudinal direction;
an inner cylinder disposed concentrically within the outer cylinder and having a fluid passageway in the longitudinal direction such that fluid can flow through the fluid passageway from the inlet side to the outlet side; and
15 an inlet section having a convergent cross-sectional shape that connects the outer cylinder and the inner cylinder at the inlet side such that the fluid enters the nozzle regulator at the inlet section and flows into the fluid passageway;
wherein the automatically deformable nozzle regulator is
20 constructed of a deformable material.

10. The automatically deformable nozzle regulator as set forth in claim 9, further comprising a nozzle regulator cavity bounded by the outer cylinder, the inner cylinder and the inlet section such that the inlet side of the nozzle regulator
25 cavity is sealed and the outlet side of the nozzle regulator cavity is open so that fluid can only flow into the nozzle regulator cavity from the outlet side.

11. The automatically deformable nozzle regulator as set forth in claim 10, wherein a backpressure in the fluid within the nozzle regulator cavity
30 generates a constricting force that causes a radius of the inner cylinder to decrease.

12. The automatically deformable nozzle regulator as set forth in claim 9, further comprising an output nozzle projecting from the outlet side of the outer cylinder and being part of the inner cylinder such that a surface area of the output
5 nozzle is capable of being in contact with the fluid.

13. The automatically deformable nozzle regulator as set forth in claim 12, wherein a backpressure in fluid surrounding output nozzle generates a constricting force causing a radius of the inner cylinder to decrease.

14. The automatically deformable nozzle regulator as set forth in claim 9, wherein the deformable material comprises rubber.

15. An outlet side regulated venturi pump for pumping fluid, comprising:
15 primary inlet that receives a fluid pressure source such that fluid under pressure flow from the fluid pressure source to the primary inlet;
a venturi throat in fluid communication with the primary inlet that decelerates the fluid flowing from the primary inlet and creates a low-pressure area at the venturi throat;

20 a secondary inlet in fluid communication with the venturi throat that allows a fluid being pumped to be drawn through the secondary inlet into the venturi throat by the low-pressure area;

an automatically deformable nozzle regulator having in fluid communication with the venturi throat that automatically adjusts its output area to
25 further decrease pressure at the venturi throat.

16. The outlet side regulated venturi pump as set forth in claim 15, wherein the automatically deformable nozzle regulator further comprises:
an outer tubular cylinder and an inner tubular cylinder concentrically
30 arranged;

an inlet section joining the cylinders at an inlet side of nozzle regulator.

17. The outlet side regulated venturi pump as set forth in claim 16,
5 wherein the automatically deformable nozzle regulator further comprises an output nozzle projecting from an outlet side of the automatically deformable nozzle regulator.

18. The outlet side regulated venturi pump as set forth in claim 16,
10 wherein the inlet section has a convergent cross-sectional shape being one of: (a) a convex curve; (b) a straight line.

19. The outlet side regulated venturi pump as set forth in claim 16,
wherein the automatically deformable nozzle regulator further comprises an
15 nozzle regulator cavity disposed between the concentric cylinders and bounded on the inlet side by the inlet section and open on the outlet side.

20. A method for automatically adjusting an output area of a
deformable nozzle regulator having an inlet side and an outlet side such that fluid
20 flows through the deformable nozzle regulator from the inlet side to the outlet side and exits at an output nozzle, comprising:

generating a backpressure of the fluid at the deformable nozzle
regulator;

constricting the output nozzle using the backpressure to reduce an
25 output area of the output nozzle; and

decreasing the backpressure to allow the output area to return to its
original size.